

THURSDAY, DECEMBER 20, 1877

## THE "INFLEXIBLE"

ON July 12 last we explained the *Inflexible* case at some length to our readers on the ground that there might be seen in it the beginning of a system which not only involved the safety of the four large and costly ships then commenced or contemplated, but which "having received countenance and sanction in the highest quarters in this country, may not improbably become extended over the navies of the world." A week later we considered the Parliamentary Papers on the subject, and came to the conclusion that the *Inflexible* was not a safe ship for battle, and that the objections brought against her had been much too lightly treated. Now that the Report of the Admiralty Committee is before us we are able—notwithstanding much that appears in it—to point our readers to it as a full and complete justification of the course we and others then pursued, for that Report concludes with these words:—"We therefore desire to bring under the very serious consideration of their Lordships the necessity, before proceeding with the construction of more vessels of the type of the *Inflexible*, of thoroughly investigating whether by more beam their safety may not be largely increased without impairing their speed and efficiency." As this appeal "to the very serious consideration of their Lordships" in arrest of the construction of other ships of the type closely follows a paragraph in which the Committee show the very great advantages of an alteration in the form and proportions of the *Inflexible's* citadel (without increase of armour), it is not conceivable that the Board of Admiralty will proceed with the other vessels of the type, and it is absolutely certain that no more ships possessing the defects of which we complained in July will be laid down. The great object which we set before ourselves, therefore, is already accomplished, and the extension of a dangerous system of design throughout our own navy, and the navies of the world, has been effectually arrested. As we know that the case of the *Ajax* and *Agamemnon* was actually before the Committee, and as their Report makes no exception of them in their appeal to the Admiralty to stop further proceedings, it is to be inferred, we presume, that the beam of these two ships will have to be increased in accordance with the Committee's views. With these results before them all those who took part in bringing about this inquiry may, we think, be congratulated on the success and value of their labours.

There only remains the *Inflexible* herself to consider in the light of the Committee's Report; and in discussing this part of the subject we must not forget that no inconsiderable portion of the report, and especially the aspect which its opening pages presents, has been greatly influenced by the form of the Admiralty reference. We take leave to say that the first of the questions put by the Admiralty to the Committee has little or nothing to do with the subject. We do not remember that even Mr. Reed, who has most strongly condemned the *Inflexible's* design ever contended that "the blowing out of the whole of the stores and cork by shell-fire" would occur very early in an engagement; and if he had, the elicitation of

a contrary opinion from the Committee would have no serious bearing upon the subject, simply because experiment, and experiment alone, can determine the degree and rapidity of the injury to which thin iron chambers filled with cork are liable. Mere opinions, in the absence of experiments, are comparatively valueless in such a case. But what we should have thought was absolutely self-evident, even without any experiment, is that shell-fire from modern ordnance would certainly blow cork packing out of thin iron chambers at some rate or other; and yet, strange to say, this is what the Committee appear to doubt, and even to deny, for they say that in their opinion that which may "be fairly assumed to represent the greatest amount of damage the ship would be likely to suffer in any action" is the condition in which, although the unprotected ends are completely riddled and water-logged, the cork and stores remain in place, and add to the buoyancy. It is fair to assume, then, according to the Committee, that in no naval action will the cork be blown out of place by shell-fire, and this in face of the fact that when an experiment was actually tried at Portsmouth the contrary result was experienced. It is of the utmost importance to note carefully that it is only by making the above extraordinary assumption—an assumption which we believe will not meet with the concurrence of scientific artillerists and seamen—that the Committee are able to oppose in any degree the opinions of the ship's danger which we and others expressed in the autumn. It is on this assumption that they rest their opinion that "the unprotected ends are as well able as the armoured citadel to bear the part assigned to them," and that therefore "a just balance has been maintained in the design." It unfortunately is made perfectly clear afterwards by the Committee that the "part assigned to them" is to hold the citadel and the rest of the ship upright, and it is clear that they cannot be presumed fit to perform this part if shell-fire can blow out the cork. This is the weak point—we venture to think the dangerously and even fatally weak point—of the Committee's Report, and one which the common sense and observation of men will prevent them from assenting to, and consequently the *Inflexible's* safety is so ill-assured that we doubt if responsible persons will sanction the completion of such a ship.

The committee have fallen, as it appears to us, into a grave inconsistency, likewise, as regards the *Inflexible* herself. They say, as we have seen, that the unprotected ends are, as designed, well able to perform their part, and well balanced with the citadel. In subsequent passages, nevertheless, they go on to disclose and assert even more serious defects in them than any of us adverse critics of the ship have alleged, and to recommend an enormous extension of the cork chambers. What is the meaning of a scientific committee dealing with an extremely grave public question in this way? Either the unarmoured ends are well designed at present, or they are not; if they are, why alter them to the very large extent—far larger than a cursory perusal of the report might lead readers to expect, for the increase of cork chambers recommended is enormous? If they are not, why has the contrary statement been made and circulated? The truth is they have not been satisfactorily designed, as we shall presently prove from the Committee's own report. But first let us

dispose of a long argument which the Committee enters upon and pursues with the object of proving that by lengthening the citadel you would thin the armour upon it, and thus reduce its defensive power. Assuredly you would: nor can any one doubt for a single moment that it would be far better to reduce the armour a little for the purpose of making the citadel stable enough to hold the ship upright in spite of any injury to the unprotected ends, rather than to keep the present thickness, and to reduce its length sufficiently to cause the whole to capsize when the unarmoured ends only are badly damaged. We know how naval officers answer this question. But, in truth, the whole argument of the Committee on this point is beside the mark, and a mere beating of the air, for no one that we know of has urged the change which the Committee take so much pains to discuss. What we have always understood Mr. Reed to allege, and certainly what we have in *NATURE* maintained is, that in the *Inflexible* the citadel and unarmoured ends were neither well-formed, well-proportioned, nor well-balanced against each other, and that a ship of her type should have embraced a larger area of flotation within the citadel and a less area within the unarmoured ends. And this is precisely what the Committee themselves declare, and thus refute their own assertion that the ship is properly designed at present. Near the end of the Report they say:—

“Results which have been obtained in the course of the experiments at Torquay on the resistance of ships, show that a considerable increase of the extreme breadth of the *Inflexible*, if accompanied by a corresponding fining of the ends so as to keep the displacement unaltered, would, if anything, diminish the resistance of the intact vessel to propulsion at full speed. Supposing the ship thus increased in beam 10 feet, and the citadel shortened so as to retain the same perimeter and thickness of armour, her transverse stability would then be about doubled in the *e* and *f*<sup>1</sup> conditions, and in the riddled and gutted condition, would be more than it now is in condition *e* or *f*. Her longitudinal stability in the riddled and gutted condition would be reduced 10 per cent. (*l*, Appendix No. 15), but would not be diminished in condition *e*, and scarcely appreciably so in *f*. The increase of beam would also add to the area of the citadel in a horizontal plane, and thus increase the buoyancy in the riddled condition.”

When the Committee, who lay down these clear and cogent proofs that the *Inflexible* is vastly inferior, in respect of stability and safety, to what she might have been, also tell us that “a just balance has been maintained in the design” of that ship, and that “a good result has been obtained,” we find great difficulty in reconciling their statements, and feel strongly that if the public were to trust only to the language of the Report they might readily be led to draw extremely wrong inferences. We much fear that the gentlemen composing the Committee have thought too much of the Admiralty, with which they are all more or less connected, and too little of the public, who have been waiting for many months for their verdict. That verdict has been pronounced in a manner which, speaking on behalf of scientific men, we lament. It is inconsistent, and, so far as we can understand it, contradictory, in its several parts, and is in large

part likely to beget in certain quarters a fatal confidence in a ship the defects and dangers of which the Committee evidently well understand. So uncertain and indefinite is it that it does not make it unquestionably clear even that the *Ajax* and *Agamemnon* are included in their desire to have progress arrested, for although after speaking of the *Inflexible* only they ask that no more vessels of the type may be proceeded with, and thus employ terms which cannot well be otherwise interpreted; the absence of all mention of their names nevertheless leaves room for the suggestion of a doubt on the point. It was clearly due to all concerned that their views on so weighty a matter should have been placed beyond all hesitation and question.

But those who would understand the full significance of this Report must not be deterred from perusing it carefully through, for if after reading thirteen out of its sixteen pages they were to throw it aside they would have derived from it, we say without hesitation, not only a very insufficient but a very untrue conception of the *Inflexible*'s actual condition. Up to that point both a hasty and a deliberate perusal of it yields, to our minds at least, the impression that the Committee are admirers of the existing ship in almost every particular. But the disclosures which the scientific conscience of the Committee demanded and enforced commence on p. 14, and thence to the end facts of an appalling nature respecting her are gradually unfolded with so much effect that even the Committee themselves end by imploring the Admiralty not to repeat such a design! Let us briefly observe what these disclosures are.

The first relates to the inclining force which the action of the rudder exerts upon a ship of small stability. The Committee made experiments with the *Thunderer* expressly to acquire facts illustrative of the *Inflexible*'s case, and the conclusion at which they arrived is thus stated:—“The *Inflexible* riddled and gutted,<sup>1</sup> and without water ballast, going at 7·24 knots, and turning in the circle of 1,210 feet in diameter, would require a righting lever or GZ of ·13 feet, and as the value of GZ at her maximum stability in this condition is only ·12 feet, *she would on this supposition overset*.” To soften down this alarming fact the Committee add: “It is, however, not to be expected that the ship under this condition could be driven at this speed”—a speed of 7¼ knots only round the circle, corresponding to only eleven knots in the *Thunderer* when steaming on a straight course! And this the reader will bear in mind is true of the *Inflexible*, not when her armour has been pierced by huge shells, or her bottom knocked about by rams and torpedoes, but when nothing but her exposed unarmoured ends have been badly injured. Her armour and her bottom may be perfectly intact, ay, untouched, and yet her own rudder would capsize her in steaming at a low speed. No statement ever made about the *Inflexible* by those who condemn her has gone or ever could go much beyond this. And what can be thought of the figures given? The line GZ is the lever or arm, at the ends of which the gravity and buoyancy of the ship act in opposite directions. The length required for withstanding the rudder's action under

<sup>1</sup> These references *e* and *f*, are to the Parliamentary Papers, and represent the ship with the ends riddled and water logged, *e*, showing the coal as well as the cork, &c., in place, and *f* with the cork, &c., in, but not the coal.

<sup>1</sup> This phrase, “The *Inflexible* riddled and gutted” is (improperly) employed by the Committee when they speak of the unarmoured ends being riddled and having the cork blown out.



the given conditions was '13 of a foot ( $1\frac{1}{2}$  inches only [!]), but even that is more than has been allowed in the design of this ship (viz. '12) in which the Committee say "a just balance" has been preserved.<sup>1</sup> And this inability of the ship to withstand her own rudder's action, and that at a low speed, even with virgin armour and a bottom untouched by ram or torpedo, having been asserted and urged by others, elicits no remonstrance or objection whatever from the Committee. And yet, when a little later on in their Report they have disclosed a somewhat similar degree of longitudinal instability—discovered, as they suppose by themselves, but already well-known and obvious, doubtless, to others—and have shown that the ship would not be safe at seven and nine knots speeds because of her tendency to capsize lengthwise (so to speak), and so more or less down headforemost, then the Committee see grave danger showing itself, for they say, "We consider that any large limitation in the ship's speed may expose her dangerously to the attack of ram or torpedo," and in the summary they incidentally tell us, in the mildest terms, that a blow from either would be fatal; "the small residuum of stability she would possess would not avail to render such an attack other than fatal." The only difference in the two cases is (and this is possibly the reason why the Committee lay the greater stress on this case) that it is not here necessary to suppose the cork or stores blown out, for a single shot or shell making a large wound near the stem, bulging a skin plate outwards, and completely rupturing the internal bulkheads, would so destroy the longitudinal stability of this large ironclad, costing more than half-a-million sterling, that even at seven knots' speed she would run her bows under; "and again," we are told by the Committee, "her speed is similarly limited to nine knots by wounds of a much less critical character in other parts of her sides." We have said that even this danger was doubtless foreseen by others—as it certainly was by ourselves, whether mentioned or not—before the Committee's Report appeared; but the Committee certainly have carried the subject a step forward by the experiments they have made with the model, and by their positive declaration that "on the whole the effect of sea-waves must be to aggravate, and in some circumstances greatly to aggravate," this very serious and certain source of danger. In a word, the very Committee who have in another place asserted that in the *Inflexible* the balance is fairly maintained between the armoured and unarmoured ends, have elsewhere in their Report shown that that balance is so ill maintained between the two, that with all the cork in place one or two shot and shell penetrating the unarmoured parts would so reduce her stability that she could not be steamed ahead with any reasonable speed, but would of necessity become a prey to any ram or torpedo craft that might evade or disregard her guns!

Another disclosure of the Committee is that the mere running out of the guns "would become a serious element of danger as the ship approaches the riddled and gutted condition." Here again they employ the phrase to which we have already intimated an objection in a foot-note, and speak of "the ship" approaching "the riddled and

gutted condition." They mean nothing of the kind; by "the ship" they mean the exposed unarmoured ends only; and here again it is to be observed that the danger disclosed is not one contingent upon the blowing out of all the cork, &c., but arises before, when the unarmoured part only *approaches* that condition. That the danger is, again in this case as in the previous one, a very serious and practical one is shown by the Committee recommending an alteration in the gunnery arrangements, proposing that the travel of the gun on the slides should be restricted, lest by running the guns out to the full extent at present arranged for, they should capsize the ship.

We have now sketched, sufficiently for our present purpose, the substance of the Committee's Report. We may end this article as we ended that of July 19, and repeat: "The conclusions we have arrived at are, that the *Inflexible* is not a safe ship for battle in her present state, that the objections brought against her have been much too lightly treated, and that the disclosure of her condition, with the circumstances that have followed it, have excited just surprise and dissatisfaction." That surprise and dissatisfaction will be greater than ever when the Committee's Report has had time to produce its full effects, both intended and unintended.

## HYDROPHOBIA

### II.

WE do not intend to do more than allude in a cursory manner to the prophylactic treatment of hydrophobia, *i.e.* to the treatment adopted to prevent the occurrence of the disease in those who have been bitten by mad dogs. The general experience of the past sanctions, as might be expected, the practice of attempting to prevent the absorption of the poison of rabies by excising or destroying by caustics the wounds inflicted by rabid animals; of the innumerable internal remedies which have been proposed and made use of with the object of preventing the development of hydrophobia in those bitten by rabid dogs, it may be said with justice that nothing whatever is known which warrants the assertions of their advocates. This is indeed a case in which the fallacies which beset all therapeutical inquiries, especially when attempted by ignorant persons and fanatics, are specially liable to obscure the truth. Of all dogs supposed to be rabid, only an infinitesimal proportion really are so, and it is but rarely that the fact of a dog being rabid is tested by having it watched until it dies, or by the unfortunate fact that some of those bitten perish by hydrophobia; then, of all persons bitten by certainly rabid dogs, only a small proportion become affected with hydrophobia, even when no treatment is adopted, so that the value of any drug or remedial measure as a *prophylactic* could only be tested by an experience such as no one ever has had.

Less uncertainty prevails in reference to the effects of treatment when hydrophobia has been developed. According to the best observers this disease has hitherto been invariably fatal. There are, it is true, a few cases—and of these two have been recorded within a comparatively recent period—in which a cure is said to have been effected, but when examined with care the gravest doubts

<sup>1</sup> The Committee, at the bottom of page 15, give us the means of readily illustrating the amount of stability which the *Inflexible* has in the case above considered, for they tell us that 60 tons in the bottom of the ship, which herself weighs over 11,000 tons, would alter the length of G Z to '12 of a foot.

\* Continued from p. 119.